Renewable Energy – Small Hydro
February 2005

Overview

Brazil has a large and diversified economy that offers US companies many opportunities to export their goods and services. As Brazil's largest single trading partner, the US enjoys a strong reputation in a variety of sectors. This report is one of a series that is published by the US Commercial Service's team of sector experts throughout the year. If you do not see an opportunity for your product here, please check out our other reports at www.buyusa.gov/brazil and consider contacting us directly to find out if we can help you export to Brazil.

Market Overview

The Renewable Energy sector in Brazil has a very large potential for development in the next years, with many new projects expected for 2005 to 2008. The main reasons for this are: (1) Brazil has excellent natural resources for wind, biomass, solar and small-hydro projects, and (2) the federal government created the Incentive Program for Alternative Electric Energy Sources (PROINFA), that guarantees the installation of 3,300 MW from small alternative sources until December 2008. This program is expected to attract US$2.5 billion in investments during the next three years. Small projects are defined in PROINFA as having a maximum installed capacity of 30 MW.

PROINFA subsidies for renewable energy
PROINFA guarantees the purchase of 1,100 MW generated annually from each of three power sources: wind, biomass and small hydro. Under this plan the Brazilian federal government, through its holding company Eletrobras, has already selected in 2004 the projects that are eligible to sell energy to the national grid in 20-year contracts (PPA) with autonomous independent producers. These selected projects will receive up to 70% cheaper financing from the Federal Economic and Social Development Bank BNDES; and must have a minimum 30% financed by equity capital. A special fund of US$280 million called "Brasil Energia" was already set up by private pension funds and BNDES to offer financing to project sponsors selected under PROINFA. In order to qualify for the PROINFA financing, a minimum of 60% of the project procurement must be of Brazilian-made equipment.

After this goal of 3,300 MW is installed, a second phase of PROINFA will immediately follow, to ensure that in the end of 20 years wind, biomass and small hydropower systems supply 10% of the annual electric power consumption in Brazil. For this second phase, only projects with at least 90% of Brazilian-made components will be eligible for BNDES financing.

Light for All
The Brazilian federal government has another important project, called "Light For All" (Luz Para Todos) which set a goal to achieve universal access to safe and affordable energy, as one of the central components in its fight against rural poverty.

There are currently nearly 18 million Brazilians living in remote communities that do not have reliable access to electricity, being that almost 10 million of them do not use electricity in any form. In the Amazon region, with an extremely low population density of 3.7 hab/km2, there are more than 1000 mini power plants, mainly using diesel oil to supply electricity to isolated villages at a very high cost. Many of them are old and inefficient.

Brazil's Current Energy Mix

Brazil needs to increase its generation capacity by an additional 3,000 MW annually. Approximately 77% of the total electricity in Brazil is generated by hydroelectric power plants, and Brazil accounts for nearly 12% of the world's hydroelectric power supply. Power shortage and rationing of electricity in 2001 led to a top government priority of diversifying the energy matrix. The rationing ended in March 2002, but it was a landmark in the progress of renewable energy in the country.

About 46% of Brazil's energy matrix comes from renewable sources, especially hydroelectricity, biomass and ethanol, while this percentage tends to be between 6% and 15% in developed countries. 98% of the Brazilian electrical market is one vast interconnected system.

Energy Mix in Brazil (Feb 2004)

Type	Capacity	%
Hydro	74,225 MW	77.3 %
Gas:	7,295 MW	7.6 %
Petroleum:	5,842 MW	6.1 %
Nuclear	2,007 MW	2.1 %
Coal	1,461 MW	1.5 %
Biomass*	2,556 MW	2.7 %
Wind	24 MW	0.03 %
Imported	2,570 MW	2.7%

* 57% of Biomass is sugarcane.

Brazil's Total Energy Matrix 2004	
Type	**%**
Petroleum	43%
Sugar Cane	15%
Hydro	14%
Firewood and Charcoal	14%
Natural Gas	9%
Metallurgical Coal	1%
Uranium	1.8%
Other Renewable Sources	3%
Steam Coal	0%

Includes all forms of energy used in Brazil, not just generation.

Sector References for Renewable Energy in Brazil

The national reference centers CERPCH (small hydro), CRESESB (wind), GREENSOLAR (solar and wind) and CENBIO (biomass) promote the development of R.E. by disseminating information, supporting studies and projects, laboratories and working groups and establish a network between industries, schools, universities, utilities and government agencies. See their web addresses in pertinent reports.

Eletrobras/Centrais Elétricas Brasileiras S.A. is the federally owned state electricity company and was until recently the former vertical monopoly, for construction, generation, transmission and distribution of electricity. power utility. www.eletrobras.gov.br

CRESESB, hosted by CEPEL Electrical Energy Research Center of Eletrobras, www.cresesb.cepel.br, manages two working groups on solar and wind, whose membership includes universities, government, agencies, private companies, research centers and engineering companies. Its website has a long list of Brazilian suppliers of products and services, divided by sub-sector, with links to their respective websites. It has worked in cooperation with the USDOE for many years, including joint-projects with the NREL. It also works very closely together with the major Brazilian utilities.

ABEER The Brazilian Trade Association for Renewable Energy and Energy Efficiency, www.abeer.org.br . It sponsors a trade show on R.E. in Brazil, to be held on Oct. 13 and 14, 2005 in Rio de Janeiro: www.saagle.com.br .

ANEEL National Agency for Electrical Energy, www.aneel.gov.br, independent regulatory agency, with powers to grant concessions and authorizations for building and operating power plants, and for supplying electricity to the national grid, and charged with promoting and regulating competition in this sector.

APMPE Association of the Small and Medium-Sized Electric Power Producers, www.apmpe.com.br, interested primarily in small hydropower projects.

BNDES National Bank for Economic and Social Development www.bndes.gov.br, the only source of financing at rates below commercial banks, is an important tool of the federal government to incentive the development of R.E. in Brazil.

IDER Institute of Sustainable Development and Renewable Energy www.ider.org.br

RENOVE National Network of Organizations for Renewable Energy www.renove.org.br, network of 26 organizations working primarily in rural areas to support the commercialization of R.E., as well as research and education. It provides technical assistance, small demonstration projects, and promotion of development models that rely on public/private partnerships. Its members are NGOs and research institutions.

USAID The U.S. Agency for International Development, www.usaid.gov, supports R.E. demonstration projects and cooperation between U.S. and Brazilian firms and public institutions.

ABIMAQ The Brazilian Association of Machinery Manufacturers, www.abimaq.org.br. It has a large databank of Brazilian suppliers of all kinds of machinery, that can be accessed online.

Winrock International, a non-profit international NGO whose mission is to support projects that increase economic opportunity, sustain natural resources and protect the environment. It works on several projects in Brazil, for natural resources management and clean energy www.winrock.org.br.

ABCE Brazilian Association of Engineering Consultants, www.abce.org.br .

Agência Mandalla www.agenciamandalla.org.br, NGO supporting sustainable development projects, including alternative energy sources.

Best Prospects - Overview

Export opportunities to Brazil in Small Hydro are for specific parts or services, but not for turn-key equipment. Since Brazil has a very diversified industry, and import duties and fees are high, Brazilian-made products are normally cheaper than similar imports. Examples of products and services that have best prospects to be imported are automation systems, remote operation control, internal combustion engines, gaseification equipment and logistical services to move wind power equipment.

Small Hydro – Maximizing Brazil's Natural Resources

Brazil has excellent hydrological resources and one of the world's highest hydroelectric capacities. Approximately 77% of the total electrical production in Brazil is from hydro sources and there is still an enormous untapped potential for hydroelectricity in the country. Besides, the hydrologic systems in the North and South have complementary rainy seasons. This makes the grid-connected energy significantly affected by seasonal factors.

Brazil has a long tradition of Small Hydro Plants (SHP) since the 19th century. The largest number of SHP plants is in the South and Southeast of the country. Among the new undertakings of the PROINFA program, many are also in the Midwest. The Northeast is a semiarid region with relatively little potential. The North has plentiful hydrologic resources but offer few promising potential sites, because of its very small population, flat landscape and dense forest vegetation.

There is also a large potential for re-activating and re-dimensioning old inefficient small and micro HP plants in Brazil There are probably more than 1,700 such SHP, especially in the south and southeast of Brazil.

The Brazilian government defines a SHP plant as having:

- Maximum 30,000 kW installed capacity.
- 3 km² maximum flooded area.
- Using generating units of 5,000 kW maximum each.
- 2 m³/s maximum flow rate.
- 10 m maximum height of dam.
- Not involving tunnels.

Local Manufacturers are proficient suppliers
Brazilian manufacturers can produce practically all components for the various types of SHP plants. The local subsidiaries of **General Electric**, **ABB**, **Alstom**, and **Voith Siemens** have large manufacturing facilities in Brazil, and offer turn-key projects, and even export from Brazil.

In addition, there are many Brazilian companies that specialize in manufacturing components for SHP and machinery for mini HP plants (under 1 MW), using 100% Brazilian technology.

The **Cataguazes-Leopoldina** ("Cat-Leo") Group works as a subcontractor, offering all kinds of services, engineering and management for SHP, including turn-key construction. This Group owned eight SHP plants, but sold all of them to the Canadian **Brascan** Group in late 2004. Its website is www.cataguazes.com.br.

Brascan Energetica, the local subsidiary of the Canadian Brascan Group, has 12 SHP plants in operation in Brazil, some of them in consortia, with a total capacity of 205 MW. It announced that it plans to invest US$500 million in Brazil to achieve 500 MW by late 2005, owning the majority stake in all projects that it participates in. It sells to power distributors and large consumers. www.brascanbrasil.com.br.

The **Camargo Correa** Group has one of the leading civil construction companies in Brazil, and is involved in construction of SHP, as well as large-hydro and thermal power plants. Its website is www.camargocorrea.com.br.

Cemig power utility has a plan to invest more than US$370 million in SHP plants. It has identified 252 plants that need overhauling, and is already working on 13 of them, with a combined 173 MW capacity. All of them are in the state of Minas Gerais. Cemig also plans to build a minimum of 30 SHP plants until 2008. See www.cemig.com.br.

CERPCH National Reference Center for Energy from Small Hydro Plants, is based in the Federal University of Engineering of Itajubá, www.cerpch.unifei.edu/br.

Additional Resources

- For more information about export opportunities in this sector contact US Commercial Service Trade Specialist Mauricio Vasconcelos at: mauricio.vasconcelos@mail.doc.gov
- For a good overview of exporting to Brazil, please look at our US Country Commercial Guide to Brazil: www.focusbrazil.org.br/ccg
- US Commercial Service in Brazil: www.buyusa.gov/brazil
- For more reports on this sector in other countries, please visit Export.gov's site for US Commercial Service Market Research Worldwide: http://www.export.gov/marketresearch.html